

Great Basin National Park Species of Management Concern (SOMC)



As mandated by NPS 77, Natural Resources Management Guidelines:

“The National Park Service will identify and promote the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats...The National Park Service also will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats...All management actions for protection and perpetuation of special status species will be determined through the park's resource management plan.”

“Management of these species should be determined at the park level in consultation with concerned and knowledgeable parties. Although specific recovery actions may not be indicated, their identification as rare or sensitive species should warrant heightened management concern.”

In addition, the Park’s primary objective as stated in the General Management Plan is:

1. Manage the park to maintain the greatest degree of biological diversity and ecosystem integrity within the provisions of the authorizing legislation.

National Park Service Management Policies (2006) provide broad authority to manage for sensitive and rare species.

“Management (should)... protect rare, threatened, or endangered species”

“The National Park Service will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the Service will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance.”

Based upon these statements, the park is mandated to identify all rare and sensitive species and their habitats within the park and to manage for their continuity.

Based upon literature reviews, fieldwork, and historical information, Resource Management staff have identified 71 species as sensitive (Table 1) based on their current status in the park as meeting one or more factors listed below as defined by NPS 77 Natural Resources Management Guidelines. These factors include:

- 1) Local rarity of native species.
- 2) Whether or not the species is endemic to the park or local vicinity.
- 3) Importance of the species to the park (as identified in park management objectives).
- 4) Whether the species is the subject of political concern or unusual public interest.

- 5) The usefulness of the species as an indicator species.
- 6) The vulnerability of the species to local population declines.
- 7) Whether the species or its habitat is subject to human disturbance during critical portions of its life cycle.

Table 1. List of species of management concern known to occur in or near Great Basin National Park. The last six species listed have not been documented in GRBA or vicinity, but their presence is likely.

Common Name	Species	Added 2014
Merriam's shrew	<i>Sorex merriami</i>	
Water shrew	<i>Sorex palustris</i>	
Inyo shrew	<i>Sorex tennellus</i>	
Pallid bat	<i>Antrozous pallidus</i>	
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	
Spotted bat	<i>Euderma maculatum</i>	
Silver-haired bat	<i>Lasionycteris noctivagans</i>	
Hoary bat	<i>Lasiurus cinereus</i>	
Fringed myotis	<i>Myotis thysanodes</i>	
Long-eared myotis	<i>Myotis evotis</i>	
Long-legged myotis	<i>Myotis volans</i>	
Ermine	<i>Mustela erminea</i>	
Bighorn sheep	<i>Ovis canadensis</i>	
Beaver	<i>Castor canadensis</i>	
Sagebrush vole	<i>Lemmyscus curtatus</i>	
Porcupine	<i>Erethizon dorsatum</i>	
Yellow-bellied marmot	<i>Marmota flaviventris</i>	
Pygmy rabbit	<i>Brachylagus idahoensis</i>	
Greater sage grouse	<i>Centrocercus urophasianus</i>	
Northern goshawk	<i>Accipiter gentilis</i>	
Swainson's hawk	<i>Buteo swainsoni</i>	
Ferruginous hawk	<i>Buteo regalis</i>	
Peregrine falcon	<i>Falco peregrinus</i>	
Three-toed woodpecker	<i>Picoides tridactylus</i>	
Lewis's woodpecker	<i>Melanerpes lewis</i>	
Flammulated owl	<i>Otus flammeolus</i>	
Short-eared owl	<i>Asio flammeus</i>	
Brewer's sparrow	<i>Spizella breweri</i>	
Sage sparrow	<i>Amphispiza belli</i>	√
Sage thrasher	<i>Oreoscoptes montanus</i>	√

Pinyon jay	<i>Gymnorhinus cyanocephalus</i>	
MacGillivray's warbler	<i>Oporornis tolmiei</i>	
yellow warbler	<i>Dendroica petechia</i>	
Black rosy-finch	<i>Leucosticte atrata</i>	
Sonoran mountain kingsnake	<i>Lampropeltis pyromelana</i>	
Great Basin whiptail	<i>Aspidoscelis tigris</i>	
Desert horned lizard	<i>Phrynosoma platyrhinos</i>	√
Great Basin spadefoot	<i>Spea intermontana</i>	
Bonneville cutthroat trout	<i>Oncorhynchus clarki utah</i>	
Lahontan cutthroat trout	<i>Oncorhynchus clarki henshawi</i>	√
Mottled sculpin	<i>Cottus bairdi</i>	
Nokomis fritillary	<i>Speyeria nokomis</i>	√
Toquerville springsnail	<i>Pyrgulopsis kolobensis</i>	
Great Basin cave pseudoscorpion	<i>Microcreagris grandis</i>	
Snake Range millipede	<i>Nevadesmus ophimonus</i>	√
Great Basin cave millipede	<i>Idagona lehmanensis</i>	√
Model Cave harvestman	<i>Sclerobunus unguatus</i>	√
Model Cave amphipod	<i>Stygobromus albapinus</i>	√
Scalloped moonwort	<i>Botrychium crenulatum</i>	√
Holmgren's buckwheat	<i>Eriogonum holmgrenii</i>	
Nevada catchfly	<i>Silene nachlingerae</i>	
Waxflower	<i>Jamesia tetrapetala</i>	
Wheeler Peak draba	<i>Draba pedicellata</i> var. <i>wheelerensis</i>	√
Snake Range draba	<i>Draba serpentina</i>	
Nevada primrose	<i>Primula cusickiana</i> var. <i>nevadensis</i>	
Holmgren's cinquefoil	<i>Potentilla holmgrenii</i>	√
Woolly head clover	<i>Trifolium eriocephalum</i> var. <i>villeferum</i>	√
Tunnel Springs beardtongue	<i>Penstemon concinnus</i>	
Wheeler Peak beardtongue	<i>Penstemon leiophyllus</i> var. <i>francisci-pennellii</i>	
Mt Moriah penstemon	<i>Penstemon moriahensis</i>	√
Wheeler Peak sandwort	<i>Eremogone congesta</i> var. <i>wheelerensis</i>	
Snowline springparsley	<i>Cymopterus nivalis</i>	
Watson's goldenbush	<i>Ericameria watsonii</i>	
Bristlecone pine	<i>Pinus longaeva</i>	√
Ponderosa pine	<i>Pinus ponderosa</i>	√
Ringneck snake	<i>Diadophis punctatus</i>	
Short-horned lizard	<i>Phrynosoma hernandesii</i>	
Intermountain wavewing	<i>Cymopterus basalticus</i>	
Pennell's whitlowgrass	<i>Draba pennellii</i>	
Rayless tansyaster	<i>Machaeranthera grindelioides</i> var. <i>depressa</i>	
Great Basin fishhook cactus	<i>Sclerocactus pubispinus</i>	

Extensive inventory efforts have been directed at mammals, reptiles, amphibians, fish, mollusks, cave invertebrates, and plants. Despite such efforts, truly rare species often remain undetected by traditional taxon-based inventory methods. Future inventories should focus on specialized survey methods such as remote cameras, direct trapping, mist-netting, pitfall trapping, owl surveys, drift fences, and acoustic detection in an occupancy framework for small mammals, shrews, birds, and bats.

Great Basin National Park species of management concern generally fall into three categories.

1) Species perceived as rare due to a fossorial, nocturnal, or secretive nature. Inventory efforts may reveal these species as common when appropriate detection methods are used. 2) Species imperiled due to habitat conversion, such as riparian, alpine, and sagebrush obligate species. 3) Truly rare species that are patchily distributed (e.g. cave invertebrates) and/or present in low densities.

The following list contains species currently recognized by federal or state agencies. Several species are not listed at federal or state levels, but their unique status or declining population trends warrant their listing as a NPS species of management concern under the criteria listed above. Thirteen species were removed from the list for the 2014 update. Species were removed because GRBA does not contain the species' preferred habitat; the park boundary lies outside their current range (long-billed curlew, California quail, western burrowing owl, fox sparrow, loggerhead shrike, speckled dace and redbreasted sunfish); or surveys revealed these species to be more common than previously known (ringtail, long-tailed weasel, striped skunk, spotted skunk and side-blotched lizard). Sixteen species were added to the list including four newly described species of endemic cave invertebrates and several alpine plant species (Table 1).

Photo credit can be found in Appendix B.

MAMMALS



MERRIAM'S SHREW (*SOEX MERRIAMI*) – Three records exist for Merriam's shrew near the park – two in Strawberry Creek and one near the town of Baker (latter from Rickart and Robson 2007). This species is widespread but uncommon in the West (Armstrong 1999). As with other shrew species, the Merriam's shrew is an insectivore feeding on a wide variety of arthropods. It can be found in riparian habitat but seems to prefer dryer herbaceous sites in sagebrush, grassland, pinyon-juniper and montane forest habitat (Armstrong 1999). It is active throughout the year. Threats are poorly understood, but may include habitat conversion to annual grasslands or rabbitbrush and conifer encroachment (NDOW 2012). Surveys are needed to determine occurrence and occupied habitat. Map

WATER SHREW (*SOEX PALUSTRIS*) – The water shrew is the largest shrew in the region weighing eight to 18 grams. Water shrews are broadly distributed throughout the northern portions of North America and can occupy a wide elevation range from 7, 500 to 11,000 feet. Water shrews are restricted to riparian habitat along perennial streams, and their diet reflects this. They feed mostly on aquatic insects and sometimes small, aquatic vertebrates (Beneski and Stinson 1987). Only a few records exist in the park for water shrews (Rickart and Robson 2005). Locality data is not available for all records. Threats include water diversions, development and habitat loss. Directed surveys are needed to determine occurrence and distribution in the park. Map



INYO SHREW (*SOEX TENNELLUS*) – The Inyo shrew is the smallest shrew species found in the park. It occurs in California and Nevada, but there is only one park record, from Lehman Creek (9,900 feet). This specimen was collected in rocky, streamside habitat (Rickart et al. 2004) and extended the known range for this species by 300 km (NDOW 2012). Inyo shrews are a montane species and can occur in rocky areas from pinyon-juniper to alpine habitats, oftentimes associated with talus. Inyo shrews are active year-round. Very little is known about the behavior or food habits of the Inyo shrew (Hoffman and Owen 1980). This species is listed as imperiled in Nevada by NatureServe, and could be affected by water diversions, development and loss of riparian habitat. Surveys are needed to determine occurrence and habitat needs. Map



PALLID BAT (*ANTROZOUS PALLIDUS*) – The pallid bat is a colonial species that occurs in a variety of habitats and over a wide elevation range. They are common in lower elevation deserts but also occur in sagebrush steppe, low to mid elevation woodlands and subalpine forests (NV Natural Heritage Program; Rickart and Robson 2005). Preferred roost sites are also diverse. The park region represents the northern distribution limit for this species in the central Great Basin (Ports and Bradley 1996; Rickart and Robson 2005). Park records exist from Snake Creek Cave and the Baker Creek cave system. The pallid bat is listed as vulnerable in Nevada by NatureServe. Roost sites include rock crevices or buildings, and less often caves, tree hollows or mines. Hibernation typically occurs in caves. As with other bat species, the

spread of white-nose syndrome, recreational caving, permanent closures of mine and cave entrances that exclude bats, and habitat loss are potential threats. More extensive sampling at potential roost sites and in foraging habitat is needed. Map



TOWNSEND'S BIG-EARED BAT (*CORYNORHINUS TOWNSENDII*) – Townsend's big-eared bats occur over a wide elevation range and a variety of habitat types (Ports and Bradley 1996). They feed mainly on moths and are dependent on caves and mines for roosting. In the spring, females form large maternity colonies of more than 100 individuals (Rickart et al. 2008); males tend to roost singly. Townsend's big-eared bats forage in wooded habitat

types near streams (NV Natural Heritage Program) and can travel long distances to forage (NDOW 2012). Park records exist for Lehman Caves, the Baker Creek cave system, Snake Creek and Lincoln Canyon along with records from several high elevation caves. Townsend's big-eared bats are declining throughout Nevada (NDOW 2012) and are listed as imperiled in the state by NatureServe. This species is highly susceptible to disturbance (Sherwin et al. 2000). Hibernation and roosting occurs out in the open in caves or mines, so big-eared bats can be easily disturbed, especially females in maternity colonies. They are heavily dependent on caves and mines and have not demonstrated flexibility in their choice of roosting sites. White-nose syndrome, recreational caving, complete and permanent closures of mine and cave entrances that exclude bats, and loss of riparian habitat are the primary threats (NDOW 2012). Continued monitoring is needed to determine foraging habitat and shifts or abandonment of hibernacula, maternity colonies and roost sites. Map

SPOTTED BAT (*EUDERMA MACULATUM*) – The spotted bat is a truly rare species in Nevada. Extensive mist-netting at cave entrances and mines has failed to document this species in the park. Two unconfirmed reports exist from Lehman Cave (1958) and Model Cave (1966), but the spotted bat is easily distinguishable from other bat species by its unique black and white color pattern. Records also exist for spotted bat from Pine Valley, UT (Jason Williams, pers. comm.). The spotted bat occurs over a broad elevation range and utilizes a variety of habitat types. It feeds on flying insects and roosts in crevices, often found in or around cliffs or rock outcrops (Rickart and Robson 2005). This species can be hard to sample, flying high enough to avoid mist nets and exhibiting sensitivity to noise and light (NV Natural Heritage Program). Acoustic sampling at caves, mines, and potential foraging habitat is recommended to document species. Map



SILVER-HAIRED BAT (*LASIONYCTERIS NOCTIVAGANS*) – The silver-haired bat is an uncommon but regular, seasonal migrant in the park region (Rickart and Robson 2005; Rickart et al. 2008). It has been listed as vulnerable in Nevada (NatureServe). Park records exist for Snake Creek and Lincoln Canyon. Silver-haired bats prefer forested habitat and tend to roost singly or in small groups in trees. Occasionally, they will roost in caves or buildings. They utilize a variety of forested and woodland habitat types (pinyon-juniper, aspen, mixed-conifer, cottonwood and limber pine), but are most commonly found in mature forests.

Roosting habitat may be a limiting factor for this species. Silver-haired bats have been shown to migrate long distances to access foraging sites. The silver-haired bat is vulnerable to alternative energy development, logging, and removal of clusters of large snags (NDOW 2012). Surveys are needed to determine roosting sites and preferred foraging habitat. Map



HOARY BAT (*LASIURUS CINEREUS*) – The hoary bat is a tree roosting species reliant on forested or riparian habitat. Records occur near Lincoln Peak and in Spring Valley (Shoshone Ponds). The hoary bat is a migratory species that is widespread throughout North America and can utilize a wide range of elevations and habitat types. Roosting sites are typically in the foliage of trees (Rickart and Robson 2005). The status of hoary bats in Nevada is unknown. It can be a difficult species to sample and has a patchy distribution in the state. The hoary bat has already been impacted by renewable energy projects. It is the most common bat mortality found at wind farms (NDOW 2012). This species is not known to be affected by white-nose syndrome (NatureServe). Acoustic surveys are needed to determine roosting and foraging sites. Map

FRINGED MYOTIS (*MYOTIS THYSANODES*) – The fringed myotis is a rare species not commonly captured during surveys (NDOW 2012). There are no park records for fringed myotis, although suitable habitat exists. The fringed myotis is a forest species common in mid to high elevation forests (Jason Williams, pers. comm.). It is widespread in the western U.S., but its distribution in Nevada is patchy (NDOW 2012) and abundance is apparently low (NatureServe). Crevices or trees are its preferred roosting site. Hibernation occurs in mines and caves. This species is highly



susceptible to human disturbance at roost sites and hibernaculum (Western Bat Working Group 2005, NDOW 2012). Fringed myotis is listed as imperiled in Nevada by NatureServe and may be vulnerable to White-nose syndrome. Threats include human disturbance of roost sites, maternity colonies, and hibernacula; recreational caving; barricades or gating of mine and cave entrances that exclude bats; and loss of habitat (NatureServe). Because of low-intensity echolocation and the tendency for fringed myotis to forage above normal mist-net height, acoustic surveys are recommended to increase probability of detection. Surveys should focus in forested habitat near forest edges or water (Western Bat Working Group 2005) and at caves or mines during emergence.



LONG-EARED MYOTIS (*MYOTIS EVOTIS*) – There are numerous park records for long-eared myotis from the Baker Creek cave system, Snake Creek and Lincoln Canyon. This species has a broad distribution and can be found throughout the state, but is considered uncommon in Nevada (NDOW 2012). Long-eared myotis are typically found in mid to high elevation forests (Rickart and Robson 2005) and are capable of foraging in dense vegetation. This species can use a variety of roosting sites, but tends to select trees, roosting under bark or in tree hollows. Females have a low reproductive rate. They form small maternity colonies in the summer where they can be vulnerable to disturbance (NV Natural Heritage

Program). Long-eared myotis are believed to hibernate in Nevada, but data on winter habits are unknown. This species may be vulnerable to white-nose syndrome (NDOW 2012). Surveys are needed to determine foraging and roosting habitat in the park. Restoration projects in forested habitat types may affect this species. Map



LONG-LEGGED MYOTIS (*MYOTIS VOLANS*) – The long-legged myotis has the broadest distribution among the bats that occur in the park region (Rickart and Robson 2005). They can utilize a wide range of elevations and habitat types. Numerous park records exist for this species. Long-legged myotis is considered a forest species despite its demonstrated flexibility in seasonal habitat selection. This species forages in and around the forest canopy and uses riparian zones (NV Natural Heritage Program). Long-legged myotis hibernate in caves and mines, but their vulnerability to white-nose syndrome is unknown (NatureServe).

Roosting sites are varied and may include tree hollows, cliff crevices, mines and caves. Visitation and closures of mine and cave entrances that exclude bats are threats. Restoration projects in forested habitat types may affect long-legged myotis. Surveys are needed to determine foraging and roosting habitat in areas other than mine or cave locations. Map

ERMINE (*MUSTELA ERMINEA*) - Ermine are restricted to mid and high elevation forests (Rickart et al. 2008). Several historic park records, wildlife observations and remote camera inventories suggest that ermine are widespread in the park. Ermine are predicted to go extinct from the Snake Range due to climate related declines in habitat quantity and quality (McDonald and Brown 1992). Easily confused with the more common and widespread long-tailed weasel, unambiguous identification requires direct measurement or photographs that allow measurement of relative tail length (Hall 1946). Trapping and remote camera inventories are recommended to document species occurrence, habitat preferences and occupancy patterns. Maintenance of mid to high elevation forest health and alpine areas are important management considerations. Map



BIGHORN SHEEP (*OVIS CANADENSIS*) - The South Snake Range currently supports a small herd of approximately 30 bighorn. Bighorns were extirpated from GRBA by the 1970s and reintroduced by NDOW in 1979. Domestic sheep, mountain lion predation and winter habitat quality are currently limiting bighorn population growth (Peek et al. 2003). Although recent fires have improved habitat dramatically, the current population is not viable, and without management intervention, the extirpation of this population is highly likely (Berger 1990). Bighorns are currently

being monitored with satellite linked GPS collars, and a project is currently examining the conservation genetics of the population. Management should focus on maintaining separation between domestic sheep and bighorns, improving habitat via fires, and augmenting the population (Hamilton 2009). Map



BEAVER (*CASTOR CANADENSIS*) - Beaver are riparian obligates and play an important role in wetland and riparian hydrology (Rickart et al. 2008). Although there is abundant historic sign (gnawed stumps and terraces) in most perennial park streams, legitimate questions persist over the nativity of beaver to the area (Hall 1946, 1981). Grayson pers. comm. Populations currently occur at lower elevations in Weaver and Strawberry Creeks outside the park.

Montane riparian areas may not be able to support beaver without connectivity to lower elevation, low gradient streams. Most park habitat is too high gradient (4-10%) to support beaver (Baker and Hill 2003, Hay 2010). Management should focus on maintaining high quality riparian habitat, protecting established populations, and carbon dating of tree stumps to determine the nativity of this species. A habitat suitability model could be used to evaluate the ability of habitat in the park to support viable beaver populations. Map

SAGEBRUSH VOLE (*LEMMISCUS CURTATUS*) - Sagebrush voles are shrub steppe obligates declining due to loss of sagebrush habitat (Rickart et al. 2008). Sagebrush voles occur over a wide elevational gradient in multiple habitats in the park, including annual grasslands (Hamilton



2003a). Population eruptions are well documented in this species (Carroll and Genoways 1980). Such variability in abundance makes monitoring and trend assessment difficult. Inventories should focus on intensive trapping during good precipitation years. Management actions should focus on the maintenance of high quality sagebrush habitat, increasing patch size and increasing connectivity of sagebrush habitat. Map

PORCUPINE (*ERETHIZON DORSATUM*) - Porcupines were formerly widely distributed and abundant in the park (Hall 1946) but populations have precipitously declined (Rickart et al. 2008).

Although porcupine populations are inherently cyclical (Spencer 1964), declines in the Great Basin are linked to mountain lion predation (Sweitzer et al. 1997). Riparian habitat forms an important part of porcupine habitats in the Great Basin. Management should focus on maintaining healthy forests, riparian areas, and shrublands. Speed enforcement is an important consideration to minimize road mortality. Inventories should continue to document and monitor populations and habitat utilization should be documented with radio telemetry. Map



YELLOW-BELLIED MARMOT (*MARMOTA FLAVIVENTRIS*) – Yellow-bellied marmots are sagebrush obligates that exhibit high fidelity to their burrow sites. They are a colonial species with a long hibernation period, typically July to March (Barash 1989). Threats include conifer encroachment into sagebrush steppe habitat. Floyd (2004) documented several potential extirpations from four isolated Great Basin mountain ranges, but targeted surveys and general wildlife observations have shown that colonies are widespread in the park (Hamilton and Horner 2010). Habitat restoration projects in sagebrush steppe have been completed or are underway.

Maintenance of open sagebrush steppe with an herbaceous understory, adequate soils for burrows, and rock outcrops for basking and lookouts are important for this species. Pre-treatment surveys are recommended within restoration project boundaries to document marmots and mark burrows. Other mitigation measures include avoiding fire or mechanical treatments when marmots are most active and foraging, March to July. Speed enforcement is an important consideration to minimize road mortality. Floyd also found connectivity between ranges suggesting that the species is not as isolated as had been presupposed by Brown (1971). Map



PYGMY RABBIT (*BRACHYLAGUS IDAHOENSIS*) – The pygmy rabbit is a sagebrush obligate dependent on mature big sagebrush for cover, forage, breeding and burrowing (Green and Flinders 1980). Burrow sites are typically in deep, friable soils to enable burrow excavation (NV Natural Heritage Program). Pygmy rabbits are endemic to the Great Basin with a very limited distribution outside of the physiographic region. They are listed as vulnerable in Nevada (NatureServe). Threats include loss of habitat and habitat connectivity to conifer encroachment, cheatgrass invasion,

development and fire (NDOW 2012). One historic record exists from Baker Creek; extant populations exist in Spring Valley. Extensive inventories were completed in the park. Only five records of pygmy rabbit sign were documented (scat or burrow); no pygmy rabbits or active burrows were encountered. A recent observation in the park occurred in Lehman Creek. The park's higher elevation and rocky soils may limit use or available habitat for pygmy rabbits. The maximum known elevation for pygmy rabbits is 2,450 m (8,038 feet) (NV Natural Heritage Program). An apparent upward elevation shift for this species has been attributed to climate change (USFWS 2010; NDOW 2012), so dispersal into the park may be possible. Maintaining mature stands of basin, Wyoming and mountain big sagebrush as well as maintaining connectivity between upper and lower elevation stands could facilitate this. Map

BIRDS

GREATER SAGE GROUSE (*CENTROCERCUS UROPHASIANUS*) – The greater sage grouse is a US Fish and Wildlife Service candidate species and a sagebrush obligate, heavily dependent on sagebrush steppe during critical portions of its life (Connelly et al. 2011). Threats include habitat loss and fragmentation, grazing, fire, energy development and predation (Great Basin Bird Observatory



2010). Sage grouse were present in the park historically, including breeding records, but only anecdotal observations have been made recently. Active leks (breeding grounds) occur outside park boundaries in Snake and Spring Valleys. Telemetry surveys in Snake Valley, in conjunction with NDOW, documented lekking grounds near Kious Basin and use of agricultural lands on Baker Ranch. Annual lek surveys are ongoing. Suitable summer habitat (wet meadow, riparian and sagebrush steppe) is available in the park.

Some habitat restoration projects have been completed or are underway including conifer removal and spring restoration. Continued lek surveys are recommended as well as cross-jurisdictional restoration efforts to improve habitat condition and connectivity. Surveys in potential summer habitat within park boundaries are also recommended. Map



NORTHERN GOSHAWK (*ACCIPITER GENTILIS*) – The Northern goshawk is a forest raptor whose nesting habitat is limited to mature aspen stands and coniferous forest. The Nevada population is estimated at 700 and has been listed as imperiled due to restricted and/or degraded aspen habitat (NatureServe 2014). The Snake Range is recognized as a key conservation area (Great Basin Bird Observatory 2010). Maintenance and restoration of park aspen stands is critical for this species. Aspen stands in the park are in extremely poor condition. Broadcast surveys have documented nesting in Can Young Canyon and South Fork Big

Wash. Incidental sightings have been reported in Snake Creek, Strawberry Creek, Baker Creek and Mill Creek. Continued broadcast surveys in potential habitat are needed. Pre-treatment monitoring is recommended for prescribed fire or thinning projects in aspen, mixed-conifer or spruce habitat. Map

SWAINSON’S HAWK (*BUTEO SWAINSONI*) – Swainson’s hawks are rarely recorded in the park despite suitable habitat (Hartley and Gubanich 2004). Records occur from low elevation shadscale survey plots outside park boundaries and one high elevation bristlecone pine site (Woodyard et al. 2003). Swainson’s hawks are long-distance migrants that winter in Argentina. This species usually occurs close to riparian or other wet habitat types and has adapted to using agricultural landscapes in Nevada. It prefers agricultural, lowland riparian and sagebrush habitat types, and avoids densely forested areas. It typically nests in large trees with overhead cover or in cliffs. Historic and recent declines have been attributed to loss of riparian habitat, pesticide use, human development, and decreases in prey populations. Species will benefit from maintenance of open riparian woodlands and open shrublands (GBBO 2010). There is a general need to document breeding birds, particularly raptors in the park. Map



FERRUGINOUS HAWK (*BUTEO REGALIS*) – The ferruginous hawk is a year-round resident in Nevada and the largest buteo in North America. Records from the park and vicinity include sites in bristlecone pine, piñon-juniper, and shadscale (Medin et al. 2000, Woodyard et al. 2003). Christmas bird count surveys often record this species adjacent to park boundaries (NPSpecies). Preferred breeding habitat for ferruginous hawks includes open sagebrush adjacent to piñon-juniper edges. Prey

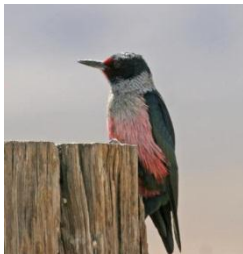
consists mostly of lagomorphs. Population declines in the 1980s spurred a petition for listing in 1991 that was not fulfilled (Great Basin Bird Observatory 2010). The densest breeding populations occur in eastern and central Nevada. This species avoids densely wooded areas; but prefers lone or peripheral trees for nesting (NDOW 2012). Management actions should maintain or improve suitable nest sites and protect active nests from disturbance (GBBO 2010), including fire and livestock (NDOW 2012). Some annual fluctuations in numbers of ferruginous hawks can be attributed to prey abundance, so improving habitat for prey is also important along with limiting human disturbance and keeping native vegetation intact (GBBO 2010). Potential conflicts exist with renewable energy development (NDOW 2012). Map



PEREGRINE FALCON (*FALCO PEREGRINUS*) – Peregrine falcons were delisted by the US Fish and Wildlife Service in 1999, but are still listed as imperiled in Nevada by NatureServe. Reintroduction efforts by state agencies reestablished peregrine falcons on the west side of the park. Occasional sightings have been reported in the park at higher elevations near Wheeler Peak, Mt. Washington and Lincoln Canyon. White Pine County is one of only three counties in the state where breeding has been confirmed since 1960 (NDOW 2012). This species uses varied habitat types, but appears to favor open

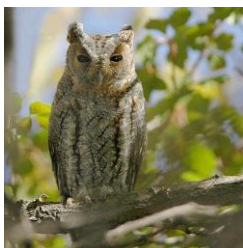
environments and nests in cliffs. Primary prey is other birds. The state population is small with estimates of 140-180 individuals. Energy development may impact foraging areas and migration corridors (NDOW 2012). Management actions should include maintaining habitat for avian prey species near cliffs or potential nesting sites; preventing disturbance near known nesting sites and adjacent foraging habitat; and implementing seasonal closures of climbing routes near known nest locations (NDOW 2012). Surveys are needed to determine if birds are still established and successfully nesting in the park and if there are newly occupied territories. Map

THREE-TOED WOODPECKER (*PICOIDES TRIDACTYLUS*) (Synonym: *P. DORSALIS*) – GRBA may represent the only records for three-toed woodpecker in Nevada (Sibley 2003, Hartley and Gubanich 2004). It prefers coniferous forest, primarily spruce, or recently burned areas. It is listed as imperiled in the state (NatureServe 2014). There have been three recent records reported from the park: 2004, 2011 and 2012. Hartley and Gubanich (2004) reported two vouchers for this species, but location information was not given. Surveys in higher elevation coniferous forest, especially spruce, are needed. Map



LEWIS'S WOODPECKER (*MELANERPES LEWIS*) – The Lewis's woodpecker is a rare, year-round resident in northern Nevada. There is only one literature record indicating its presence in park (Hartley and Gubanich 2004). No recent records or observations have been reported. Habitat for this species includes vulnerable vegetation types including aspen, cottonwood and Ponderosa pine (NDOW 2012). This species is listed as sensitive or vulnerable because of historic range contractions and population declines.

The Nevada population is estimated at 13,000. It is a weak excavator reliant on large, dead snags with natural cavities or abandoned holes for nesting (GBBO 2010). Surveys are needed in riparian habitat, aspen and ponderosa pine habitats.



FLAMMULATED OWL (*OTUS FLAMMEOLUS*) – Flammulated owls are documented from the Snake Range (Great Basin Bird Observatory 2010). White-fir encroachment into Ponderosa pine and aspen may be degrading suitable habitat. Flammulated owls have slow reproductive rates, are insectivorous and are cavity nesters, often using flicker holes. Management should focus on improving limited Ponderosa pine woodlands with mechanical thinning and prescribed fire. Inventory methods should be owl specific and allow positive identification to species. Map



SHORT-EARED OWL (*ASIO FLAMMEUS*) – Short-eared owls are uncommon in Nevada. They are known from only a few locations outside the park, although suitable habitat exists within park boundaries. Short-eared owls are vole specialists, and habitat needs for this species correspond with prey choice. Short-eared owl populations tend to track fluctuations in vole abundance, which can undergo considerable variation. Habitat associations include wet meadow, sagebrush steppe with a robust herbaceous component, and grasslands

(Great Basin Bird Observatory 2010). Species specific inventories in the park are needed. Diurnal surveys may prove most productive. Management should focus on improving or maintaining sagebrush steppe, wet meadow and grassland habitat types to maintain or improve prey abundance. Map

BREWER'S SPARROW (*SPIZELLA BREWERI*) – Brewer's sparrows occur in the park and have declined on average by 2% per year since 1968. They are included on the Audubon Watchlist. Populations have declined since the 1960's, with larger declines since the 1980's due to loss of sagebrush habitat (Hartley and Gubanich 2004). Management should focus on maintaining and improving sagebrush steppe habitat. Brewer's sparrows are the most successful of the sagebrush obligates at utilizing montane sagebrush habitat which is available in the park. Map



SAGE SPARROW (*AMPHISPIZA BELLI*) - Sage sparrows are a conservation priority species that require large patch sizes of sagebrush habitat. The species has suffered historic and recent population declines and their habitat is threatened by conifer encroachment and annual grasses (Great Basin Bird Observatory 2010). Monitoring should focus on documenting populations and breeding bird surveys. Management should focus on protection of habitat and restoration of sagebrush. Map

SAGE THRASHER (*OREOSCOPTES MONTANUS*) - Sage thrashers are a stewardship species in Nevada. Sage thrashers are not declining to the same extent as other sagebrush obligate bird species but are still declining. They are a priority species and short distance migrant that require large patch sizes of sagebrush habitat. This species has suffered historic and recent population declines and their habitat is threatened by conifer encroachment and annual grasses (Great Basin Bird Observatory 2010). Monitoring should focus on documenting populations and breeding bird surveys. Management should focus on protection of habitat and restoration of sagebrush. Map



PINYON JAY (*GYMNORHINUS CYANOCEPHALUS*) – Pinyon jays utilize both pinyon-juniper woodland and sagebrush habitat, and appear to prefer transition zones between the two or sagebrush openings within pinyon stands. Telemetry studies in White Pine County (2007-2009) revealed limited use in dense woodland habitat (Great Basin Bird Observatory 2010). This species is commonly encountered during annual bird surveys, but is

experiencing range-wide declines. Threats include habitat loss through infilling of sagebrush patches, and loss of understory and mixed age classes within pinyon stands. Maintaining understory vegetation and sagebrush patches within pinyon stands will be important. Map



MACGILLIVRAY'S WARBLER (*OPORORNIS TOLMIEI*) (Synonym: *Geothlypis tolmiei*) – MacGillivray's warbler is a migrant and an indicator of riparian health. It utilizes a variety of habitat types, but seems to prefer dense shrub cover, willows and wet habitats in parts of its range. This species is listed as apparently secure in Nevada (NatureServe), but may be vulnerable to loss or degradation of riparian habitat. Breeding bird surveys have documented this species in several park watersheds with perennial streams. Maintenance of riparian and wet meadow habitat within the park will benefit this species. Map

YELLOW WARBLER (*DENDROICA PETECHIA*) – Yellow warblers are restricted to wet, brushy riparian habitat. This species is a migrant and an indicator for riparian health. The Nevada population is listed as vulnerable by NatureServe. Breeding bird surveys have confirmed their presence in the park in several perennial watersheds: Baker, Lehman and Strawberry Creeks. Maintenance of riparian and wet meadow habitat will benefit this species. Map



BLACK ROSY-FINCH (*LEUCOSTICTE ATRATA*) – The black rosy-finch is a known breeder in the Snake Range and is dependent on open alpine habitat, making it vulnerable to climate change. This species has a small global population (est. 20,000) and restricted summer and winter habitat. Critical winter roost sites are located in caves, mine entrances or rock fissures in lower elevation pinyon-juniper and sagebrush habitat (Audobon 2007; GBBO 2010). During the summer months, the black rosy-finch utilizes alpine habitat on Wheeler Peak, Bald Mountain and vicinity (Medin 1987, Medin et al. 2000, Woodyard et al. 2003). Protection of alpine habitat and critical winter roost sites, including appropriate gating of cave and mine entrances, is an important management consideration (NDOW 2012). Breeding bird surveys in alpine habitat should be conducted to verify continued breeding within the park, survey alpine habitat for additional populations, and monitor this species' response to changing climatic conditions. Map

REPTILES

SONORAN MOUNTAIN KINGSNAKE (*LAMPROPELTIS PYROMELANA*) – Sonoran Mountain kingsnakes are only documented from the park in Lincoln Canyon (two anecdotal records exist from the east side of the park). This species occurs widely in other areas of the Snake Range, and its apparent absence from the east side of GRBA is puzzling. Kingsnakes are highly secretive but occur across a wide elevation and habitat gradient (Hubbs 2004). Inventory efforts should include pitfall trapping, drift fence arrays, road surveys, visual encounter surveys and radio telemetry. The species is popular in the pet trade and collection is prohibited in Nevada and regulated in Utah. Map





GREAT BASIN WHIPTAIL (*ASPIDOSCELIS TIGRIS*) – Whiptails occur in low elevation habitats across the Great Basin (Setser et al. 2002). Only one park record occurs outside the Baker Administrative site in lower Lehman Creek. Management should focus on protecting the park’s most suitable habitat, the Baker Administrative Site and documenting this species at higher elevations. Map

DESERT HORNED LIZARD (*PHRYNOSOMA PLATYRHINOS*) – Although widespread across the Great Basin (Setser et al. 2002, Stebbins 2003), desert horned lizards are found in the park only at the Baker Administrative Site. This species prefers low elevation, shrub habitat and are nearly entirely myrmeciphagous in their diet (Stebbins 2003). Horned lizards are collected commercially in Nevada. Management should focus on protecting low elevation habitat on the Baker Administrative site. Map



AMPHIBIANS



GREAT BASIN SPADEFOOT (*SPEA INTERMONTANA*) – Although widely distributed regionally (Linsdale 1940, Setser et al. 2002, Stebbins 2003), the Great Basin Spadefoot is the only amphibian species occurring in the park (Hamilton 2003b). The only suitable habitat is the Baker Administrative site. They likely breed and metamorphose outside the park. Management should focus on avoiding disturbance to the Baker Administrative site. Radio telemetry could be used to locate breeding habitat and subsequently protect it. Map

FISH



BONNEVILLE CUTTHROAT TROUT (*ONCORHYNCHUS CLARKI UTAH*) – Bonneville cutthroat trout (BCT) are the only salmonid native to eastern Nevada and Great Basin National Park. BCT were presumed extirpated from the park (Williams et al. 1999), but several populations were later discovered. Seven populations occur in the park, five of which were reintroduced by park staff. The park’s small, isolated populations of BCT occur in headwater streams making them susceptible to stochastic events such as large floods and forest fires and vulnerable to environmental effects associated with climate change (Heino et al. 2009). BCT are susceptible to competition and predation with nonnative brook trout and brown trout, as well as introgression with rainbow trout. Proper barrier installations are needed to isolate and protect native trout populations from nonnative fish, and future augmentations may be required to sustain existing populations. The pristine conditions of headwater streams need to be maintained. Infrastructure maintenance and improvements are needed to prevent negative impacts from roads and trails to BCT streams. Map

LAHONTAN CUTTHROAT TROUT (*ONCORHYNCHUS CLARKI HENSHAWI*) – Lahontan cutthroat trout (LCT) are listed as Threatened under the Endangered Species Act wherever they may occur. LCT is the largest of the cutthroat species and is native to the Lahontan Basin. A small, self-sustaining population has occupied Baker Lake (10,600 ft.) since 1986 when the park was created. Fin clips collected in 2011 from Baker Lake identified the population as pure Lahontan with no evidence of rainbow trout or other cutthroat species (Shirizowa 2012). Although they have cohabitated for many years, the LCT population is threatened by a population of nonnative brook trout in the lake. Both competition and predation are likely mechanisms that may work in concert with the natural history traits of brook trout to mature at younger ages and have greater size-specific fecundity than cutthroat trout (Kennedy et al. 2003). At this time, we recommend that the purity of this Lahontan cutthroat trout population be recognized. While it is an introduced population, it may have conservation use for populations in the Lahontan Basin (Shirizowa 2012). Management considerations include suppressing brook trout in Baker Lake using fine mesh gill net techniques or rod and reel. Map



MOTTLED SCULPIN (*COTTUS BAIRDI*) – Mottled sculpin are broadly distributed across the United States and native to the Upper Snake River Basin and isolated populations in endorheic basins in Nevada (Page and Burr 1991). Mottled sculpin were reintroduced to Strawberry Creek and South Fork Big Wash. The Strawberry Creek population was augmented several times without success; only a few individuals have been captured in subsequent sampling attempts. No mottled sculpin were caught after augmentations in South Fork Big Wash. Barriers to successful reintroduction are most likely due to predation from Bonneville cutthroat trout. Future reintroduction efforts should first introduce sculpin, to establish a sustaining population before adding predatory species. Relevant references: Haskins (1991); Andersen & Deacon (1996), Sigler and Sigler (1987). Map

INVERTEBRATES



NOKOMIS FRITILLARY (*SPEYERIA NOKOMIS*) – This medium-sized butterfly (6.3-7.9 cm wing span) is in the brush-foot family and lives throughout the west. Males patrol for receptive females who walk on the ground to lay single eggs near host plants. Unfed, first-stage caterpillars hibernate; in the spring they feed on leaves of their host plant, *Viola nephrophylla*. Their habitat includes moist meadows, seeps, marshes and other riparian areas. Threats include draining of habitat and human development. This species is considered secure globally, though it might be quite rare in parts of its range, especially at the periphery. Management recommendations include habitat protection and management. Moderate grazing is compatible with this species and may be necessary. Map

TOQUERVILLE SPRINGSNAIL (*PYRGULOPSIS KOLOBENSIS*) – Springsnails (family Hydrobiidae), are small (1-8 mm), sexually reproducing aquatic mollusks. They are oviparous, with reproduction occurring several times a year. They feed on algae (Sada 2001). Springsnails are most abundant



near spring sources, with species from the genus *Pyrgulopsis* especially abundant in areas with watercress (Sada 2001). The Toquerville springsnail is only found in springs near Snake Creek. This species is wide-ranging as currently taxonomically defined. The main threats to springsnails are habitat alteration from surface water diversion, livestock grazing, groundwater depletion, and nonnative macroinvertebrates. Recommendations include

protecting park water sources, education and outreach about aquatic invasive species and proper cleaning techniques, and periodic monitoring. Map

Cave Biota



GREAT BASIN CAVE PSEUDOSCORPION (*MICROCREAGRIS GRANDIS* MUCHMORE) – This pseudoscorpion is 15-20 mm long, with tan to reddish coloring. It was first collected in Lehman Caves in the late 1930s, and since then has been found in several park caves: Pictograph, Little Muddy, Crevasse, Cave 24, Fox Skull, Lehman Annex, Model, Root, Squirrel Spring, Systems Key, Water Trough, and Broken Cave. It is endemic to Great Basin National Park.

Recommendations are to limit entry into caves containing this species as well as conduct periodic monitoring. Since this species is endemic to the park and found in Lehman Cave, it is a good species to highlight to help the public understand the cave ecosystem. Map



SNAKE RANGE MILLIPEDE (*NEVADESMUS OPHIMONIS* SHEAR) – This small, white millipede, only about 10 mm long, is a cave invertebrate often found in moist areas on soil or bedrock. It has been found in Lehman, Little Muddy, Model, Snake Creek, and Wheeler's Deep Caves, along with one cave outside the park. It is endemic to the South Snake Range. Threats include climate change and over-visitation. Recommendations are to limit entry

into caves containing this species (e.g., Model Cave) and conduct periodic monitoring. Map

GREAT BASIN CAVE MILLIPEDE (*IDAGONA LEHMANENSIS* SHEAR) – This white to yellow millipede is about 10-20 mm long with a cylindrical body. It has been found in caves with water present like Model, Water Trough and Squirrel Springs along with several alpine caves (Bristlecone Cave, Cave 24, Lincoln Canyon Mine and Pine Cone Cave). In addition, the Great Basin cave millipede is also found in Ice Cave, Systems Key Cave, and Wheeler's Deep. It was found in 2006 and described as a new species in 2007. It is endemic to Great Basin National Park. Threats include climate change and over-visitation. Recommendations include periodic monitoring and limiting entry into caves containing this species. Map





MODEL CAVE HARVESTMAN (*SCLE ROBUNUS UNGULATUS* DERKARABETIAN) – The harvestman is a predator generally found on moist surfaces in caves. It was first found in Model Cave and described in 1971 by Briggs as *Cyrtobunus unguulatus unguulatus*; since then it has been found in several other park caves: Crevasse, Halliday’s Deep, Ice, Upper Pictograph, Wheeler’s Deep, Systems Key, and Cave 24. In 2014, it was elevated to the species level and moved to a different genus (*Sclerobunus*). It is endemic to GRBA. Threats include climate change and over-visitation. Recommendations are to limit cave access and conduct periodic monitoring. Map

MODEL CAVE AMPHIPOD (*STYGOBROMUS ALBAPINUS*) – This amphipod species was discovered in November 2008 and described as a new species in 2011. Thus far, it has only been found in Model Cave, in water. This species seems to prefer warmer, more conductive groundwater than cooler and less conductive surface water. Threats include water withdrawals that may lower the water table and pollutants from upstream in Baker Creek (e.g. fire retardant and oil spills). Recommendations include periodic biological monitoring, protecting park water resources, especially groundwater, managing wildfires in the Baker drainage with as little fire retardant as possible, and swift response to any spills near Baker Creek. Map



PLANTS

Thirteen species of rare and/or sensitive plant species occur within Great Basin National Park. An additional four species occur locally but remain undocumented in the park. Six species are former Category 2 candidates for listing under the Endangered Species Act and are now designated by the US Fish and Wildlife Service as species of concern.

In 2004 and 2005, a survey was completed to assess the location, distribution and relative abundance of five species including Holmgren’s buckwheat (*Eriogonum holmgrenii*), Wheeler Peak penstemon (*Penstemon leiophyllus* var. *francisci-pennellii*), Nevada primrose (*Primula cusickiana* var. *nevadensis*), Nevada catchfly (*Silene nachlingerae*) and snowline (Elko) springparsley (*Cymopterus nivalis*).



SCALLOPED MOONWORT (*BOTRYCHIUM CRENULATUM*) – OPHIOGLOSSACEAE – Presence is confirmed in the park in Snake Creek near Johnson Lake. Scalloped moonwort, also known as dainty moonwort, is a diminutive species native to the western United States, but it is an aquatic or wetland dependent in Nevada. This species is limited to higher elevation, wet meadows in the park. It is listed as a species of concern by the US Fish and

Wildlife Service, BLM and the US Forest Service. It is also included on the Nevada Natural Heritage Program At-Risk list and NV Native Plant Society list. Management should focus on restoration and maintenance of mid to high elevation wetlands, wet meadows and springs. Relevant references: Morefield (2001), NNHP (2012), Clifton (2012), USDA (2015).



HOLMGREN'S BUCKWHEAT (*ERIOGONUM HOLMGRENII*) – POLYGONACEAE – Holmgren's buckwheat, or Snake Range buckwheat, is endemic to the South Snake Range and is estimated to occur on 387 acres of park lands. It occurs on quartzite and limestone talus in alpine and subalpine areas. Populations in GRBA have been extensively mapped, but demography, natural history and ecology are largely unknown. It is listed by several federal and state agencies as a species of concern (US Fish and Wildlife Service, US Forest Service, NV Natural Heritage Program, and NV Native Plant Society). Threats include recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map

NEVADA CATCHFLY (*SILENE NACHLINGERAE*) – CARYOPHYLLACEAE – Nevada catchfly, also Nachlinger's catchfly, is endemic to central Great Basin ranges (e.g. Snake, Quinn, Ruby). This species is rare and is estimated to occur on 129 acres in the park. Nevada catchfly is a US Fish and Wildlife Service species of concern; a US Forest Service, Region 4 sensitive species; designated a NV Special Status Species by the BLM; and is listed on the At-Risk species list by the NV Natural Heritage Program. Like many Great Basin endemics, Nevada catchfly is found primarily in isolated alpine areas on limestone substrates. Populations in the park have been extensively mapped and occur primarily in the Lincoln Peak and Mount Washington areas. Threats include illegal OHV use and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map



WAXFLOWER (*JAMESIA TETRAPETALA*) – HYDRANGEACEAE – Waxflower is a rare and local central Great Basin limestone endemic. It is listed as a US Fish and Wildlife Service species of concern; US Forest Service, Region 4 sensitive species; designated a NV Special Status Species by the BLM; listed as an At-Risk species by the Nevada Natural Heritage Program; and on the NV Native Plant Society watch-list. Waxflower occurs primarily on limestone cliffs, talus, and canyons in alpine and subalpine environments. Several locations and collections have been documented in GRBA, mostly in the Mount Washington and Lincoln Canyon areas. Threats include illegal OHV use and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map

WHEELER PEAK DRABA (*DRABA PEDICELLATA* VAR. *WHEELERENSIS*) – BRASSICACEAE – Presence in the park is confirmed. It is also called Wheeler Peak whitlowcress. This species is a Nevada endemic. It is on the Nevada Natural Heritage Program At-Risk-List and on the NV Native Plant Society watch list. It occurs on a range of soils, including limestone within the park. This species is limited to the highest areas of the South Snake Range on rocky slopes and crevices of cliffs near Wheeler



Peak, Mt Washington and along Highland Ridge (Clifton 2012). Threats include domestic sheep grazing, illegal OHV use and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities.

SNAKE RANGE DRABA (*DRABA SERPENTINA*) – BRASSICACEAE –

Presence in the park is confirmed. It is also called Snake Range whitlowcress or serpentine draba. This species is a Nevada endemic. It is listed as sensitive by the US Fish and Wildlife Service and US Forest Service. It is listed as threatened by the NV Native Plant Society and included on the At-Risk List for the NV Natural Heritage Program. It occurs in rocky alpine and subalpine areas often associated with limestone. Threats include domestic sheep grazing, illegal OHV use and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Synonymous with *D. oreibata* var. *serpentina*. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map



NEVADA PRIMROSE (*PRIMULA CUSICKIANA* VAR. *NEVADENSIS*) –

PRIMULACEAE – Nevada primrose occurs on 316 acres of alpine and subalpine limestone and is endemic to east-central Nevada. The US Fish and Wildlife Service ranks Nevada primrose as a species of concern as does Region 4 of the US Forest Service, the Nevada Natural Heritage Program and the Nevada Native Plant Society. It occurs in limited habitat and is therefore susceptible to disturbance.

Threats include illegal OHV use and recreational use of alpine and subalpine areas.

Management should focus on protecting alpine areas from disturbance and documenting additional localities. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map

HOLMGREN'S CINQUEFOIL (*POTENTILLA HOLMGRENII*) – ROSACEAE – Presence in the park is confirmed. This is a high elevation species found on rocky slopes, ridge tops and alpine turf, typically above 10,000 feet. It is listed as at-risk by the Nevada Natural Heritage Program and on the Nevada Native Plant Society watch-list. Management should focus on protecting alpine areas from disturbance and continued monitoring through GLORIA protocols. [*P. nivea* L., misapplied.] Relevant references: NNHP (2012) and Clifton (2012).



WOOLY HEAD CLOVER (*TRIFOLIUM ERIOCEPHALUM* VAR. *VILLEFERUM*) –

FABACEAE – Presence in the park is confirmed; also known as woolly clover. This is a very limited, lower elevation species known only from a small campsite in Snake Creek. It is a wetland species, typically found in wet meadows and shaded, riparian habitat. This species is included on the Nevada Natural Heritage Program's At-Risk List and a watch list species for the NV Native Plant Society. Inventories are needed to document additional localities.

Management should focus on maintenance of low elevation riparian habitat and strict mitigation measures for restoration or capital improvement projects within riparian areas where this species occurs, especially in Snake Creek. Relevant references: NNHP (2012), Clifton (2012), USDA (2015).

TUNNEL SPRINGS BEARDTONGUE (*PENSTEMON CONCINNUS*) – SCROPHULARIACEAE – Presence in the park is confirmed; also known as elegant penstemon. It is a rare, local species endemic to the central Great Basin. The US Fish and Wildlife Service, US Forest Service, NV Natural Heritage Program and NV Native Plant Society all list it as a species of concern. Tunnel Springs beardtongue can be found on gravelly, mid-elevation alluvial slopes with sagebrush and pinyon-juniper. Threats include grazing, transportation and facility development, pinyon-juniper encroachment, and exotic plants. Management should focus on protecting known populations and potential habitat from disturbance and documenting additional localities. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map



WHEELER PEAK PENSTEMON (*PENSTEMON LEIOPHYLLUS* VAR. *FRANCISCI-PENNELLII*) – SCROPHULARIACEAE – Subspecies *francisci-pennellii* is an east-central Nevada endemic. It is listed as sensitive by the BLM, the NV Natural Heritage Program and the NV Native Plant Society. It occurs on dry, rocky alpine and subalpine slopes, in alpine meadows, and in forest openings at mid to high elevations. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Other common names are Pennell's or smoothleaf beardtongue. Synonymous with *P. francisci-pennellii*. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map

MT. MORIAH BEARDTONGUE (*PENSTEMON MORIAHENSIS*) – SCROPHULARIACEAE – Presence in the park is confirmed (Pole Canyon). Species also occurs in the North Snake Range. This is a rare, local, native species endemic to very few ranges in the central Great Basin (North and South Snake, Kern). It is listed as a US Forest Service and Nevada Natural Heritage Program sensitive species and included on the Nevada Native Plant Society watch-list. It occurs in scrubby woodlands at 7,000-9,000 feet. Inventories should be conducted in suitable habitat to document additional localities for this species. Relevant references: Morefield (2001), Clifton (2012), USDA (2015).



WHEELER PEAK SANDWORT (*EREMOGONE CONGESTA* VAR. *WHEELERENSIS*) – CARYOPHYLLACEAE - Presence is confirmed in the park, although GRBA herbarium collections contain no subspecific taxonomy and only a few locations in the park have been documented. Endemic subspecies *wheelerensis* is critically rare in Nevada, occurring only in the Snake Range and Ruby Mountains. Wheeler's sandwort is on the NV Natural Heritage Program's watch-list but was removed from the NV Native Plant Society's watch-list. It occurs in alpine and subalpine environments. Threats include domestic sheep grazing and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Synonymous with *Arenaria congesta* var. *wheelerensis*. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map





SNOWLINE (ELKO) SPRINGPARSLEY (*CYMOPTERUS NIVALIS*) – APIACEAE – Snowline springparsley, also called snow wavewing, occurs on 718 acres of park land. A globally secure native species, snowline springparsley is considered rare in Nevada. It is included on the Nevada Natural Heritage Program’s watch-list. It occurs on dry alpine and subalpine slopes and ridges, frequently on limestone, but it is not a true limestone endemic. Threats include illegal OHV use and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Relevant references: Clifton (2012), USDA (2015). Map



WATSON’S GOLDENBUSH (*ERICAMERIA WATSONII*) – ASTERACEAE – Presence is confirmed in the park. Globally secure native species, but relatively rare in east-central Nevada. It has been delisted by the NV Native Plant Society, but is included on the NV Natural Heritage Program’s watch-list. Watson’s goldenbush occurs on cliffs, rock outcrops, generally on dry sites across a wide elevation range. Threats include domestic sheep grazing, illegal OHV use and recreational use of alpine and subalpine areas. Management should focus on protecting alpine areas from disturbance and documenting additional localities. Synonymous with *Haplopappus watsonii*. Relevant references: Morefield (2001), Clifton (2012), USDA (2015). Map



BRISTLECONE PINE (*PINUS LONGAEVA*) – Bristlecone pines are one of the longest-lived organisms on Earth. This five-needle pine occurs fairly frequently between 8,000 and 11,000 feet (Clifton 2015). Although stable over its entire range, this species is vulnerable to climate change, white pine blister rust and possible mountain pine beetle outbreaks. Management should focus on monitoring and preventing impacts to high elevation stands of ‘ancient’ trees by limiting dispersed recreation in those areas, illegal wood harvest, and loss of high value stands by fire or insect outbreaks. Map

PONDEROSA PINE (*PINUS PONDEROSA*) – The distribution of Ponderosa pine is limited in the park due to historic logging and a century of fire exclusion. Fire is the dominant process in maintaining Ponderosa pine stands (Provencher et al. 2010). With an intact seed bank, it is an early colonizer after fire. Some stands in the park are limited to riparian corridors. It is vulnerable to mountain pine beetle outbreaks and encroachment by white fir and pinyon pine. Management actions should focus on reintroduction of fire and preventing infestations of mountain pine beetle with the use of pheromone patches (e.g. Verbenone). Map



Plants and animals not known in GRBA but presence possible



RINGNECK SNAKE (*DIADOPHIS PUNCTATUS*) – Ringneck snakes are undocumented from the park (Hamilton 2003a), but museum records and observations from Snake Valley and nearby mountain ranges suggest the species occurs in suitable habitat (Bosworth et al. 2004). Ringneck snakes are highly secretive and patchily distributed in the Great Basin (Linsdale 1940, Stebbins 2003). Inventory efforts should include pitfall trapping, drift fence arrays, road surveys and visual encounter surveys.

SHORT-HORNED LIZARD (*PHRYNOSOMA HERNANDESII*) – Short-horned lizards are not documented in the park (Hamilton 2003a) but suitable habitat exists. Short-horned lizards have different habitat requirements than desert horned lizards, differ in diet, and are far less common and more patchily distributed in the Great Basin than desert horned lizard (Stebbins 2003). Short horned lizards prefer sagebrush habitat but also occur sympatric with desert horned lizards in some areas in greasewood habitat. Although short-horned lizards use montane areas in some states, they do not use this habitat in the Great Basin. Horned lizards are collected commercially in Nevada. Inventories should attempt to locate this species in suitable habitat with visual encounter surveys. A photograph voucher is necessary to document relative horn length.



INTERMOUNTAIN WAVEWING (*CYMOPTERUS BASALTICUS*) – APIACEAE – Presence in the park is unconfirmed, but possible. Intermountain wavewing is a rare native species endemic to areas in western Utah and White Pine County, NV, including the North Snake Range. It is listed as a sensitive species by the Nevada Natural Heritage Program and included on the Nevada Native Plant Society's watch-list. It is also listed in the park's General Management Plan as a sensitive species. Intermountain wavewing is found in low and mid-elevation sagebrush and piñon-juniper communities. Inventories are needed in suitable habitat to document this species. Relevant references: Morefield (2001), Clifton (2012), USDA (2015).

PENNELL'S WHITLOWGRASS (*DRABA PENNELLII*) – BRASSICACEAE – Presence in the park is unconfirmed, but possible. This is a rare species endemic to White Pine County, Nevada, specifically the Schell Creek Range. It is listed as a sensitive species by the US Forest Service and the Nevada Natural Heritage Program. It has been de-listed by the Nevada Native Plant Society. It occurs in cracks, crevices, rocky slopes and ledges, possibly associated with limestone, over a wide elevation range. Inventories should focus on suitable habitat to document this species in the park. Relevant references: Morefield (2001), Clifton (2012), USDA (2015).

RAYLESS TANSYASTER (*MACHAERANTHA GRINDELIOIDES* VAR. *DEPRESSA*) – ASTERACEAE – Presence in the South Snake Range is confirmed but not within GRBA. It is an intermountain species, but variety *depressa* is relatively rare in Nevada. This species is on the watch-list for the Nevada Natural Heritage Program, but has been de-listed by the Nevada Native Plant Society. It is a low elevation species that occurs on dry, barren places with alkaline soils. Inventories are needed to document this species within park boundaries. Synonymous with *Eriocarpum*

grindelioides var. *depressa* and *Haplopappus nutallii* var. *depressus*. Relevant references: Morefield (2001), Clifton (2012), USDA (2015).

GREAT BASIN FISHHOOK CACTUS (*SCLEROCACTUS PUBISPINUS*) – CACTACEAE – Presence in the park is unconfirmed, but this species occurs at lower elevations below park boundary. The Great Basin fishhook cactus is a globally secure native species, but in Nevada it is limited to the Baker area in White Pine County. This species is protected in Nevada. It occurs on rocky flats and hillsides with saltbush, sagebrush and pinyon-juniper, generally below 7,000 feet. Surveys are needed within the Baker Administrative Site to document this species and prevent illegal commercial collection. Relevant references: Clifton (2012), USDA (2015).

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APPENDIX B. Photo credit

L. Arnold	
	<i>Marmota flaviventris</i>
Roger W. Barbour	
	<i>Sorex palustris</i>
	<i>Antrozous pallidus</i>
	<i>Lasionycteris noctivagans</i>
	<i>Myotis volans</i>
Glenn Bartley (birds.audobon.org)	
	<i>Oporornis tolmiei</i>
John Cang	
	<i>Mustela erminea</i>
Mark. A. Chappell	
	<i>Lemmiscus curtatus</i>
Glenn Clifton	
	<i>Botrychium crenulatum</i>
	<i>Draba pedicellata</i> var. <i>wheelerensis</i>
	<i>Draba serpentina</i>
	<i>Jamesia tetrapetala</i>
	<i>Potentilla concinnus</i>
	<i>Potentilla moriahenensis</i>
	<i>Silene nachlingerae</i>
	<i>Trifolium eriocephalum</i> var. <i>villiferum</i>
Gerald and Buff Corsi	
	<i>Erethizon dorsatum</i>
Coburn Currier	
	<i>Brachylagus idahoensis</i>
David Hunter	
	<i>Microcreagris grandis</i> Muchmore
	<i>Nevadasmus ophionis</i> Shear
	<i>Idagone lehmanensis</i> Shear
	<i>Sclerobunus unguatus</i> Derkarabetian
Jukka Jantunen (birds.audobon.org)	
	<i>Picoides tridactylus</i>
Christy Klinger	
	<i>Falco peregrinus</i>
Jacque Lowery	
	<i>Spizella breweri</i>
	<i>Amphispiza belli</i>
J. Lutz	
	<i>Buteo regalis</i>
Karl Maslowski	
	<i>Castor canadensis</i>
Tim Mullican	
	<i>Sorex merriami</i>
Martin Myers	
	<i>Accipiter gentilis</i>
	<i>Melanerpes lewis</i>
	<i>Oreoscoptes montanus</i>
	<i>Gymnorhinus cyanocephalus</i>
Larry Neel	
	<i>Buteo swainsoni</i>
	<i>Asio flammeus</i>
Paul A. Opler	
	<i>Speyeria nokomis</i>
B. Moose Peterson	
	<i>Myotis evotis</i>
Fred Peterson	
	<i>Otus flammeolus</i>
Eric A. Rickart	
	<i>Sorex tenellus</i>
Greg Scyphers	
	<i>Leucosticte atrata</i>
Steven J. Taylor	
	<i>Stygobromus albapinus</i>
Steve Ting	
	<i>Centrocercus urophasianus</i>
Merlin D. Tuttle	
	<i>Euderma maculatum</i>
Margaret Williams (NV Native Plant Society)	
	<i>Primula cusickiana</i> var. <i>nevadensis</i>
	<i>Penstemon leiophyllus</i> var. <i>franciscipennellii</i>
	<i>Cymopterus nivalis</i>
	<i>Ericameria watsonii</i>
Public Domain	
	<i>Corynorhinus townsendii</i> (BLM)
	<i>Myotis thysanodes</i> (USGS)
National Park Service Photo	
	<i>Lasiurus cinereus</i>
	<i>Ovis canadensis</i>
	<i>Lamprolaima pyromelana</i>
	<i>Diadophis punctatus</i>
	<i>Aspidoscelis tigris</i>
	<i>Phrynosoma platyrhinos</i>
	<i>Phrynosoma hernandesii</i>
	<i>Spea intermontana</i>
	<i>Oncorhynchus clarki</i> <i>utah</i>
	<i>Oncorhynchus clarki</i> <i>henshawi</i>
	<i>Cottus bairdi</i>
	<i>Pyrgulopsis kolobensis</i>
	<i>Eriogonum holmgrenii</i>
	<i>Arenaria congesta</i> var. <i>wheelerensis</i>
	<i>Pinus longaeva</i>
	<i>Pinus ponderosa</i>

